Instruction Manual

1200X Microscope

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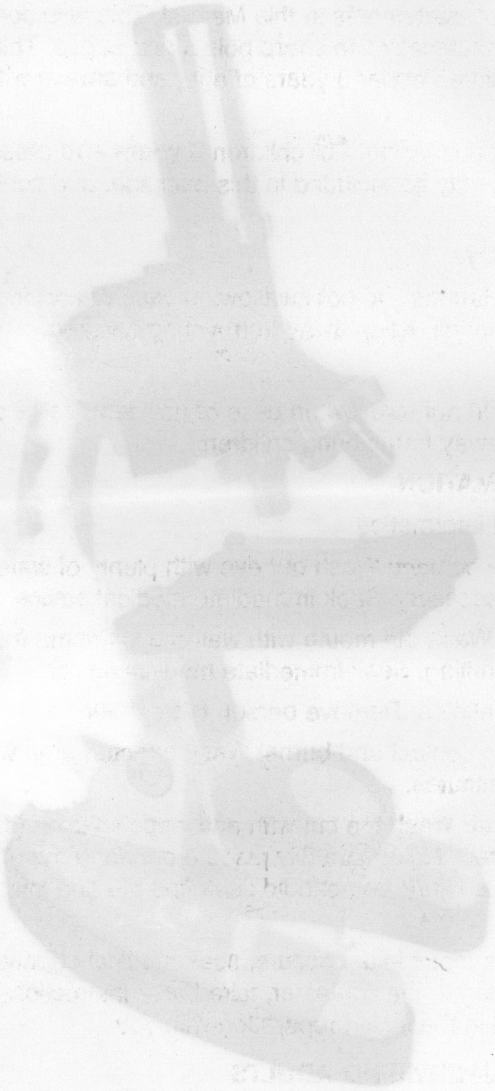

Your new 1200X Microscope is a doorway to new and exciting adventures and is designed to bring hours of enjoyment, wonder and just plain fun. Discover the hidden microscopic world around you!

Before trying out your new equipment, please take the time to read the important Cautionary and Safety information below.

CAUTIONARY STATEMENTS

NOTE: This set may include chemicals that could be harmful if misused. Read all cautionary statements in this Manual. This also contains instruments and other materials with sharp points and edges. This set is not to be used by children under 8 years of age, and always with adult supervision.

Use under adult supervision. For children **8 years and older**. The following chemicals may be included in this package, and could be harmful if misused.

Eosin Biological Dye

CAUTION: Harmful. Do not swallow. In case of accident, call a doctor. Keep away from young children.

Gum Media

CAUTION: Do not swallow. In case of accident, call a doctor. Keep away from young children.

SAFETY INFORMATION

General First Aid Information

a) In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.

b) If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.

c) In case of inhalation: Remove person to fresh air.

d) In case of skin contact and burns: Wash affected area with plenty of water for 15 minutes.

e) In case of a cut: Wash the cut with antiseptic solution (if unavailable, use clean water). Next, carefully place a bandage over the wound. In case of serious injury, you should seek first aid and inform a doctor as soon as possible.

f) If in doubt or serious injury occurs, seek medical attention immediately. In addition to the container, take these instructions and any material used in the slide preparation with you.

ADVICE FOR SUPERVISING ADULTS

a) Read and follow the instructions, the safety information and the first aid information carefully. Keep them on hand for reference.

b) The incorrect use of chemicals can cause injury and damage to one's health. Use only the slide preparations listed in the instructions.

c) This microscope is for children 8 years and older, and only with adult supervision.

d) Because children's abilities vary, even within age groups, supervising adults should exercise discretion regarding which slide preparations are suitable and safe for children. The instructions should aid adults in assessing slide preparations to discern their suitability for each child.

e) Supervising adults should discuss the warnings and safety information with the child before commencing the preparation of slides. Pay particular attention to the safe handling of chemicals (if used).

f) Your preparation space should be kept clean, clear and away from any food storage areas. Prepare your slides in a well-lit area and close to a water supply. A solid table with a heat resistant top should also be used.

g) A separate tin or bucket should be used for the disposal of solid waste materials. Any wasted solution should be poured directly down a drain, but never into a sink basin.

h) To be used solely under the strict supervision of adults that have studied the precautions provided.

Caution: Use care to install batteries in the orientation indicated by illustration in the battery slots of the battery holder. Follow battery manufacturer's precautions. Do not install batteries backwards or mix new and used batteries. Do not mix battery types. If these precautions are not followed, batteries may explode, catch fire or leak. Improperly installed batteries void your Meade warranty.

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Let's Begin!

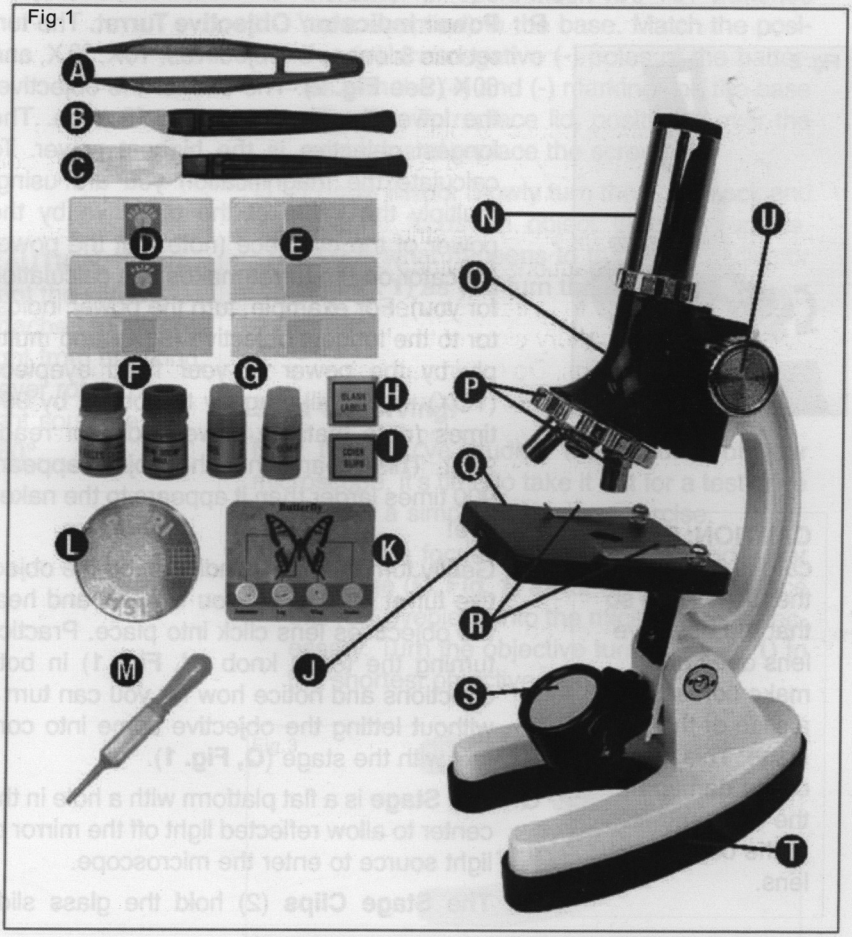
Carefully lift the microscope from the box using two hands. Place one hand around the microscope arm and the other under the base. For best results, use the microscope on flat, sturdy surfaces. Always be mindful of your mirror and light source. The more light that is reflected or transmitted through the hole in the stage, the brighter and sharper the images will appear in the microscope eyepiece.

Microscope Features

Take a few moments to study Figure 1 and become familiar with the various parts and features of your microscope.

A. Tweezers
B. Scalpel
C. Spatula
D. Prepared and blank Slides
E. Color Filters
F. Gum Media, Eosin
G. Sea Salt, Brine Shrimp Eggs
H. Blank Labels

Fig.1



I. Slide Cover Slips

J. **Color Filter and Aperture Wheel.** The color filters are incorporated in the stage. Use these filters to add colors and enhance an image in the eyepiece.

K. Butterfly Specimen

L. Petri Dish

M. Eyedropper

N. **The Eyepiece** with fixed lens that has a 30X magnification. Remove the dust cover from the eyepiece and put it aside in a safe place.

O. **The Body Tube.** Connected to the eyepiece and helps focus the lenses.

P. **Power Indicator/ Objective Turret.** The turret has 3 lenses or objectives: 10X, 20X, and 60X (See **Fig. 2**). The shorter the objective, the lower the power or magnification. The longest objective is the highest power. To calculate the magnification you are using, multiply the value of the objective by the power of the eyepiece (note that the power indicator on the turret makes this calculation for you). For example, turn the power indicator to the longest objective (90X), and multiply by the power of your fixed eyepiece (10X) – you will magnify the object by 900 times (note that the power indicator reads 900). This means that the object appears 900 times larger than it appears to the naked eye!

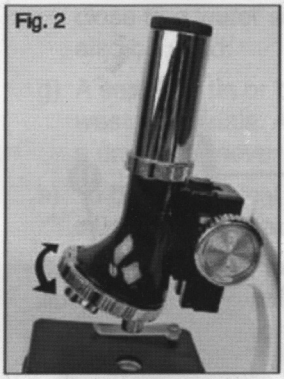
Gently turn the power indicator on the objective turret (**P, Fig. 1**). You will feel and hear the objectives lens click into place. Practice turning the focus knob (**U, Fig. 1**) in both directions and notice how far you can turn it without letting the objective come into contact with the stage (**Q, Fig. 1**).

Q. **The Stage** is a flat platform with a hole in the center to allow reflected light off the mirror or light source to enter the microscope.

R. **The Stage Clips** (2) hold the glass slide

TIP: Begin viewing at the lowest magnification or power and focus the object. Once the image is focused, increase magnification by turning the objective turret and refocus.

Fig. 2



CAUTION: Be careful as you turn the focus knob so that the objective lens does not make contact with a slide or the stage. This may cause damage to the slide and also to the objective lens.

firmly onto the stage.

S. **Mirror/Light Source**. While holding the base down, pull on the arm to tip the microscope back. Examine the mirror and light source located below the stage to see how you can adjust them, and choose one or the other. The light source turns on automatically when tipped upwards toward the stage. The mirror gathers and reflects light into the microscope.

TIP: Always keep both eyes open when looking through the eyepiece. Doing so will relieve stress on your eyes.

T. **Base/Battery Compartment**. Place the microscope on its side. To remove the protective plastic cover, remove the screws with a Philips head screwdriver. Gently lift and the base will open. Insert two "AA" batteries (user supplied) in the base. Match the positive (+) and negative (-) poles of the batteries with the (+) and (-) markings on the base (**Fig. 3**). To replace lid, position it over the opening and replace the screws.

U. **Focus Knob**. Slowly turn the knob back and forth to focus an object in the eyepiece. Notice what happens to the power indicator (**P, Fig. 1**) as you turn the knob.

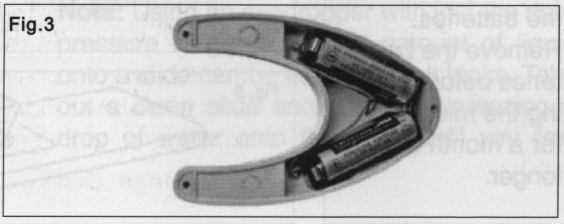
CAUTION: To prevent the wires attached to the light from breaking, never rotate the light source a full 360°.

Start Observing!

Now that you've studied the features of your microscope, it's time to take it out for a test drive and try out a simple observing exercise.

1. Rotate the focus knob (**U, Fig. 1**) and lower the stage (**Q, Fig. 1**) as far as it will go. Place the 10X eyepiece into the microscope, if necessary. Turn the objective turret (**P, Fig. 1**) to the shortest objective (4X).

Fig.3



CAUTION: Be careful not to touch the slide with the objective lens. You can break the slide and/or the lens by touching the slide with the lens.

NOTE: The view presented in the eyepiece is upside-down and reversed from left to right of the object. In other words, if you wish to examine more of the left side, move the slide to the right. Or if you wish to examine more of the top of the image, move the slide down—and vice-versa.

CAUTION: When you are finished observing, be sure to turn the light source around, if necessary, so that it turns off and doesn't wear down the batteries. Remove the batteries before storing the microscope for a month or longer.

2. Put one of the prepared glass slides (**D, Fig. 1**) under the stage clips (**R, Fig. 1**) and position the prepared specimen over the hole in the stage.
3. Look through the eyepiece (**N, Fig. 1**) and slowly turn the focus knob until the specimen can be seen in focus.
4. Observe what happens when you slowly move the light source (**S, Fig. 1**) or the mirror. Adjust the mirror or light source to provide the amount of light that gives you the best image.
5. Look in the eyepiece and observe what happens to the image when you move the slide from side to side and up and down.
6. If you wish to increase magnification, rotate the objective turret to a higher power and refocus. Also, observe with the 25X eyepiece. Practice rotating the objective turret to change magnification.

Try Out the Color Filter

Rotate the color filter located below the stage (**Q, Fig. 1**). Below the stage, a fitting will line up with the opening in the center of the filter. Rotate the filter wheel to change filter colors.

Turn on the light. Set it so it shines through the filter. Take a blank slide and place a few grains of salt or sugar on it. Rotate the filter and see how the filtered light enhances the image of the salt or sugar.

Fig. 4

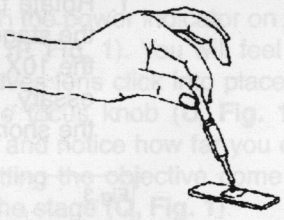
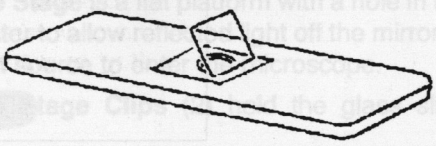


Fig. 5



NOTE: Use the color filter especially when looking at clear or dim specimens.

Hatching Brine Shrimp

Brine shrimp are tiny crustaceans that are ideal for study with a microscope. Crustaceans are sea creatures with hard shells and antennae. Crabs and lobsters are perhaps the most well-known crustaceans. Brine shrimp are the major part of the diet of many sea creatures. The word brine means water containing noticeable amounts of salt. Brine shrimp are salt water creatures.

Your microscope kit comes supplied with sea salt, and brine shrimp eggs (**G, Fig. 1**). The brine shrimp eggs included with this set are dried and will remain alive for up to five years if stored in a cool, dry place.

Perform the following procedure to hatch the brine shrimp eggs:

1. To hatch the eggs, first prepare a brine solution. Pour the entire contents of the vial containing the sea salt (**G, Fig. 1**) into a quart of tap water. Add the brine shrimp eggs into the solution. Allow the solution to stand at room temperature (70° - 80°F or 21° - 26°C) for 24 to 48 hours and the eggs will hatch into nauplius larvae (this is the first stage of development after leaving the eggs).
2. Place some of the larvae into a small dish.
3. Place some fresh brine solution in another dish. Add a small amount of yeast to this new solution. Then, using the eyedropper (**M, Fig. 1**), transfer some of the larvae into this dish as well. The yeast will serve as food and produce oxygen for the larvae as they develop into maturity. Without food and oxygen, the shrimp cannot develop and will die. Mature brine shrimp are known as Artemia Salina.

   Note: Using an eyedropper with just the right pressure to get a desired amount of liquid onto a slide can be harder than it looks. Take out a clean slide and practice squeezing a drop of water onto the slide until you feel

comfortable that you can control the size of the drop that you're squeezing out.

4. Observe the life cycle of the shrimp as they grow: the dried eggs, the hatching eggs, the developing larvae, and finally, the mature shrimp.
5. The mature shrimp may be fed to fish in an aquarium if you so wish. However, first remove the shrimp from the brine solution and place them into fresh water. An increase in salt may harm the fish in the aquarium.

Make Your Own Slides

It's so easy to make slides that the variety of slides you can create will be limited only by your own imagination.

A section of almost any material can be placed on a slide and observed with a microscope. All you need is the proper equipment and a little patience, and you'll be making slides in no time.

Everything you need for the experiments in this booklet can be found in this kit or your home (make sure to ask a parent first before you borrow any of his or her items, such as the measuring cup). Locate the follow items:

- Scissors
- Paper towels
- Petroleum jelly
- A measuring cup
- Natural, uncolored toothpicks
- 2 or 3 small bottle caps
- Wide mouth jar and lid
- 3 or 4 paper cups, or any small containers which can be discarded after use.

Next, set up your work area....the kitchen table (make sure to ask a parent for his or her permission), the desk in your room....any place where you can work undisturbed.

Label 3 of your cups: clean, flush and waste. Fill the flush cup with clean water. Next, you will obtain a specimen and make your first slide.

Want to See Crystals?

Use a measuring cup to measure one or two

TIP: Don't always assume that increasing magnification will produce the best image for viewing.

Each time you increase in magnification, the amount of light decreases, and the section of the image you are able to view also decreases. This is desirable for some specimens, but not for others.

Experiment observing with all three objectives for all specimens until you get a feel for magnification levels.

ounces of hot (but not boiling) water and pour it into a clean cup. Slowly add as much salt to the water as will dissolve. Stir the solution continuously while adding the salt.

Use the eye dropper (**M, Fig. 1**) to place one or two drops of the salt solution onto a clean slide (**Fig. 4**).

Allow the slide to dry. You are now finished with your tools for this experiment. Clean your tools: put the eyedropper in the flush cup, take up some water and release it into the waste cup. Do this two or three times. Stir the flush water.

The slide will dry covered with a white substance. Place the slide into the microscope stage. Rotate the light source of the microscope until it turns on. Before reading any further, look through the microscope eyepiece and write down what you observe.

If you carefully performed the experiment, you will see little crystal cubes. A grain of table salt is made up of many cubes. Place one or two grains of table salt on another blank slide and compare it with the slide containing the crystal cubes.

If you wish to save your crystal slides, use a toothpick to put one or two drops of gum media (**F, Fig. 1**) on the slide and gently place a cover slip on top of the media (**Fig. 5**). Lightly tap the cover slip with a toothpick to evenly spread the media under the slip.

Attach a label to each slide and set aside for a few days until the media dries. If you don't wish to save the slides, wash the slides in clean water and liquid soap. Rinse well and dry.

Further Experiments: Try out the above procedure with other salts such as Epsom and Rochelle. Sugar will also crystallize, but you will need to let it dry overnight for the crystals to form.

Begin to start thinking like a scientist as you perform your experiments. Observe carefully, take notes (make sure you date them), and most importantly, keep your equipment and the working environment clean. Experiments work best with clean and uncontaminated equipment. And your parents will be appreciative of a clean work area, too.

Preparing a Mount

Dip your spatula (**C, Fig. 1**) in some clean water and make a smear across a clean slide. Use your tweezers (**A, Fig. 1**) to place a portion of an

insect—a wing, a leg, or an antenna—on the slide. Attach a cover slip (**I, Fig. 1**) over the specimen and place the slide on the microscope stage.

Obtain a piece of hair from your head or from your pet and place it on a wet slide. Try this again with more than one type of hair on a slide and compare how they differ. Also try a piece of fern (or other plant) and pollen and compare them as well.

To save your slides, put gum media on a clean dry slide and then position your specimen in the media. Place a cover slip over the media and attach a label.

Creating Smears

Using your scalpel (**B, Fig. 1**), gently scrape off small shavings from the surface of a freshly cut potato.

Smear the shavings onto a clean slide (see **Figs. 6 and 7**). Clean the scalpel by swishing it in the flush water. Draw up some water using your eyedropper from the cup labeled clean and put one drop onto the slide. Attach a cover slip to the slide and place to the microscope stage. Observe the slide and write down your observations. You will see hundreds of starch grains.

Take a few kernels from an uncooked ear of corn. Scrape off some shavings and make a smear as you did with the potato. Compare how the corn is different from potato. Create smears of other foods such as apples, bananas, peaches, and pineapples. You will observe that these items have membranes rather than starch.

Fig. 6

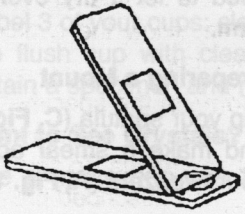


Fig. 7

To save your slides, put gum media on a clean dry slide and then position your specimen in the media. Place a cover slip over the media and attach a label.

Before you make a permanent mount, you may wish to stain the specimen first.

Staining Smears

Not all specimens are easily observed in the microscope. Staining specimens make them easier to see. Staining is not difficult, but it does require care. It is recommended that you keep paper towels nearby as the process can be messy.

First, create a fresh smear (you may use shavings from an apple or other piece of fruit), as described previously. Do not place any water or a cover slip on the specimen. Set the slide aside to dry, if necessary.

When the slide is dry, use the eyedropper to place one drop of eosin (**F, Fig. 1**) on the slide. From the cup labeled flush, draw up water into the eyedropper. Dispose of the water into the cup labeled waste. Perform this operation a few times to clean out all the eosin from the eyedropper.

Tilt the slide from side to side to spread the stain over the specimen. Remove the excess fluid to the waste cup. Put down the slide and wait about two minutes.

To flush away the excess stain and to stop the staining action, hold the slide at an angle over the waste cup. Using the eyedropper, touch the slide just above the specimen area and slowly let the water drain into the cup.

With a paper towel, pat the underside of slide dry. Be very careful and try not to touch the specimen. Allow the specimen to air dry for several minutes.

Some of the specimen will be flushed away, but enough will remain on the slide to make good observations. To save your slides, follow the procedure described previously.

Note:

In order to stain a slide, you will need to prepare the eosin:

Without opening the container, look closely at the container marked "Eosin (**F, Fig. 1**)." You'll notice a few grains of 'dust' at the bottom of the container. These are the grains of eosin. Remove the container's lid and use the eye dropper (**M, Fig. 1**) to fill the container with water. Gently stir the mixture. You have now prepared the eosin for use.

A Simple Section Slide

Section slides are extremely thin slices of tissues of skin, leaves, flower stems, and other materials. Generally, section slides are very difficult to make without special equipment and procedures. However, there is one common household item which can be sectioned without special equipment: the common onion, made up of layers of tissue.

Peel off the very thinnest layer you can. One that is nearly transparent will make an ideal section. Slice into a piece about 1/4 x 1/4 inch.

CAUTION: The blade of the micro-slicer is very sharp. Handle the micro-slicer with care.

Put two drops of eosin (**F, Fig. 1**) in a bottle cap. Pick up the piece of onion with your tweezers (**A, Fig. 1**) and place it in the bottle cap.

Wait for a minute or two. Using the tweezers, remove the piece from the stain. Hold it over the waste cup and flush it with clean water from your eyedropper. Place it on a clean slide. To save your slide, follow the procedure described previously.

Life Under Glass

Fill a wide mouth jar with fresh water. Let it stand for three or four days without the lid. Then drop a handful of dry grass and a pinch or two of dirt into the jar. Put the cap on the jar and keep it in a place where it will receive light (but not direct sunlight).

In about five days, you may examine the water. First make a special slide: Using a toothpick, make a ring of petroleum jelly on a clean slide. The ring should be smaller than a cover slip and be about half as thick as a slide.

Put a drop of water from the jar onto the slide inside the ring. Use the lowest power of your microscope and write down your observations. Did you detect any movement in the water? The movement is caused by microscopic animals. Try to focus on one of the animals – this may not be very easy as a drop of water is like an ocean to a microscopic creature.

If the animals seem to be moving too fast to

study or don't stay in focus for very long, soak up a little bit of water with a corner of a paper towel.

Care for Your Microscope

The MEADE 1200X Microscope is a precision optical instrument and, when treated with care, will provide you with years of use and discovery fun.

- Always carry the microscope with two hands —one around its arm and one under the base.
- Always remove slides from the stage before putting the microscope away.
- Cover the microscope when not in use.
- Do not use anything except lens cleaning tissue to clean the lenses.
- Never touch a slide with the objective lenses of the turret.
- Remove the batteries before storing the microscope for a month or longer.

Remember, you can make a specimen slide out of almost any material. When you are on a playground, at school, in a park, or just sitting around at home, train yourself to look at all the material around you. Keep an eye out for what might make a good specimen and discover the hidden microscopic world that surrounds us all.